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Remedial Proposals for Former Military Lands in Georgia

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Introduction

The state of the environment in Georgia is influenced clearly by political and economic situation of the recent several years and the consequences of it are the pollution and disorder of natural equilibrium in different regions to a great extent.

The survey concerning the state of former military regions in our country is an initial attempt for the solution of one of the specific issues of this global problem.

After withdrawal of former Soviet Troops from the territory of Georgia and transmission of their former military bases to Georgian Government, in already heavily polluted country new problems have emerged. The question is the toxic and explosive substances, harmful waste, most of which is unfit and is not liable to utilisation. For example, near the coast of Black Sea, and in Eastern Georgia as well, more than thousand tons of liquid rocket fuel components as "Melange" and "Simine" are distributed without control, which creates significant risk for the population and environment. Some cases of their spilling without neutralisation into the Black Sea, leakage in soil and even explosion are observed. The reservoirs of the fuel are located near to Soganlugi, Meria, Chaladidi regions and Supsa pipeline construction. Part of them is deformed and part of them damaged. Because of expiration, the pressure in some of them has dangerously increased. According to former Soviet Army instructions "Melange" was neutralised with the water solution of caustic sodium and "Simine" with solution of bohr acid and after mixing with kerosene were burnt. The technological scheme is hardly acceptable from the environmental point of view. The new schemes for rendering harmless these substances are suggested which inevitably need special scientific processing.

Increase of radioactive background is observed in various regions of former Military Troops (Vaziani, Lilo, Abastumani, Senaki, Telavi, Poti, Kutaisi, Kopitnari). The radiation is caused by parts of damaged radiometric equipment with the source of radiation, which are distributed without control from rubbish heaps even to apartments and yards of the habitants.

Concerning this problem on October 9, 1997, by the order of President of Georgia the special Governmental Commission was established, whose objective is to study chemical and radioactive pollution in the territories transmitted to Georgian Governmental structures by the Soviet troops.

Because of deficiency of means and special equipment the commission has to work in extremely hard conditions. That influences a quality of work and increases hazards and disaster likelihood.

By the members of this commission in collaboration with representatives of International Agency of Nuclear Energy, the area for temporary storage of radioactive waste has been chosen, which has to meet the international norms and will be in action after completing of corresponding work. in

Again the lack of finances creates constrains.

One of the main reasons of these events is incomplete special form of the document concerning territory transmission, from one side to another and the absence of a specific law on the issue. The Laws of Georgia on Environmental Permit and on State Environmental Assessment do not contain specific articles for creating necessary documents and delineating responsibilities for each side.

Apart from the Ministry of Environment and Natural Resources Protection, there are more than hundred environmental NGO's in Georgia. But in spite of this number, co-ordinated and purposeful work in this field is not carried out.

Due to this situation the group of Georgian scientists from Institutes of Geophysics, Physiology, Academy of Science supported by Ministry of Defense, Parliamentary Security Committee and the Department of Political-Military Affairs of Georgia express the willingness to conduct the special research and field works.

Future Collaboration

The contact with Federal Ministry of Environment, Nature Conservation and Nuclear Safety of Germany has been created to obtain the Risk Assessment Models applicable to the sites suspected of military and armament-related contamination. The German Federal Government started early with a comprehensive system to register, investigate, assess and clean up the sites left by Soviet Troops. The system Germany applied to deal with these sites was based on the following subsystems:

ALADIN:	Residual Pollution Data Information System
MEMURA:	Model for the Initial Assessment of Suspected Residual Pollution Areas
MAGMA:	Model for the Risk Assessment of Military and Armament Contaminated Sites
KOSAL:	System for Cost Assessment for Clean up of Contaminated Sites

These systems although specifically developed for the withdrawal of Soviet Troops from Germany are recognised and used for other sites as well. They stood the test in a very difficult phase and guaranteed an even approach to all sites, thus providing a sound basis for setting the priorities. The use of the system has substantially helped to avoid excessive cost for individual site characterisation and assessment.

After delivering these methodological materials to Georgians, German representatives kindly proposed collaboration in conducting the works in Georgia. The negotiations are held already on a governmental level and in the nearest future it will be possible to start working with assistance of this reliable and probated method.

Theoretical View on the Functional Capacity of the Biological Systems Under the Hazardous Impact

At the same time it would be very important to define the values of functional reserves of the ecological regulatory systems under the exogenic impact of the hazardous influence.

The different types of impacts accompany the systems during their existence and lead to the reconstruction, (reorganisation) directed to modification of systems' elements' functional level according to the changed biological and energetical demands. The systems adaptive action could be studied by using the natural laws of the controlled processes.

Adaptive reactions of the system are provided by the co-ordinated action of its autonomous and central regulatory links, in the different extent of realisation and its corresponding ways (monitoring, regulation and control) and depend on:

1. the biological properties,
2. the initial functional state,
3. the resistance of the system and
4. the type of the impact of different intensity (moderate, expressed, extreme), complexity (impulse, uneven, linear increasing) and duration (brief, long term and short)

For the investigation of the system's reactions on hazardous impact and for the foreseeing the likelihood of the regulation break-down and out-of control processes, we suggest to study the degree of activation of systems, considering specific heterogeneity of the responses on the impacts of varying intensity.

Characteristic feature of the biological parameters is their variability due to changing conditions.

There exist some defined range of equilibrium for the system, within the frame of which location of parameters is relatively indifferent from the position of the system's integrity and normal functioning.

Under the moderate impact on the system the values of its parameters can fluctuate. The notion of standard deviation was chosen as a quantitative exponent, which can judge (evaluate) the character of fluctuation of parameter's values. It reflects the measure of dispersion of the separate values of the parameters related (referred) to the average value and is the average square of deviation of variants from mean values of given multitude.

The permanent fluctuation of the parameter's values yields non-zero standard deviation in the background state of the system and the possibility of its increase under the impacts.

The moderate impacts can lead to uni-directed fluctuation and the parameters new value can change the position by level within equilibrium range.

The expressed impact, which however does not affect the linear functioning of the system, could be compensated by the system itself, forcing the values of its parameters back in the frame, what more in any point of it. At the same time, the impact which leads out the value of parameters from the equilibrium range, transmits the system from the monitoring to the regulatory level, activates other regulatory system, which start to regulate tightly the values of parameters, that brings to the abrupt decrease of fluctuation and, hence, of the standard deviation.

Perhaps, only under extreme and subextreme impacts, after exhaustion of the functional abilities of the system, the increase in variability is observed again, which however does not prevent the future decrease of the standard deviation after activation of another, more capable system, or the formation of the new functional one.

Thus, there exists the general biological rule, according to which the activation of the regulatory systems leads to the decrease of the dispersion of the regulating parameters' values, decrease in the entropy and removes the uncertainty from the regulatory system.

This approach can help to solve the important task: the evaluation of the activation of the regulatory system, which works on holding back controlled value of parameter.

From the position of system reaction prediction in response to the impact, evaluation of these reactions by means of the dispersion analyses has number of advantages:

1. The increased reliability of the system's background state evaluation.
2. The possibility of drawing-up the prognostic line "intensity-reaction" for the impacts of different intensity.
3. This approach can significantly alter the perceptions of the values of threshold and permissible limited impacts and concentrations.
4. To make precise the values of the regulatory reserves and the system state equilibrium ranges.

As to the organisational suggestions, we are going to draw attention of investigators from different scientific institutions and research laboratories to this issue, to make attempts to focus their interests on this problem and involve them in research work according to their field of study and the objects of investigation.

According to problem priority and in case of availability of the finances, it will become possible to give temporary jobs to outstanding specialists, to co-ordinate the monitoring of the situation and work on the proposals for the amendments to Georgian Laws on the basis of reliable data.

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